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RESEARCH ARTICLE

The Context of Distraction: Moderating Effects of Academic Discipline and Socioeconomic Status on Cell Phone Multitasking and GPA among Indian Undergraduates

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Abstract

This study investigated how cell phone multitasking (CPM) influences academic performance, measured by Grade Point Average (GPA), among Indian undergraduate students. A total of 476 students from a large private university in Northern India completed a structured survey assessing CPM frequency, socioeconomic status (SES), academic discipline, and institutional phone-use policies. Hierarchical regression analysis was conducted to examine the predictive relationship between CPM and GPA and to test the moderating effects of SES and academic discipline. Results indicated a significant negative association between CPM and GPA ($\rho = -0.15$, $p < 0.001$), with students who multitasked more frequently exhibiting lower academic performance. In the final regression model, CPM emerged as a statistically significant but modest predictor of GPA ($\beta = -0.06$, $p < 0.05$), explaining a small proportion of variance in academic outcomes ($\triangle R^2 = 0.035$, total $R^2 = 0.130$). The effect size was small but significant ($\eta p^2 = 0.016$, 95% CI [0.000002, 0.0106]). The negative association was stronger among STEM students ($\rho = -0.20$, $p < 0.001$) and those from lower SES backgrounds ($\rho = -0.25$, $p < 0.001$), suggesting that both cognitive load and socioeconomic constraints exacerbate the academic costs of multitasking. Furthermore, stricter institutional phone policies mitigated CPM's adverse impact on GPA. These findings demonstrate that frequent multitasking with mobile phones hinders academic achievement, particularly among students facing higher cognitive demands or limited resources. The study underscores the importance of structured phone-use policies, targeted digital literacy programs, and equitable academic support to help students regulate digital distractions and enhance learning outcomes in higher education contexts.

Keywords: Cell Phone Multitasking; Academic Performance; Cross-Cultural Psychology; Digital Distraction; Cognitive Engagement; Self-Regulation.

INTRODUCTION

Overview: The Digital Distraction

In an era where digital connectivity is ubiquitous, smartphones have become an indispensable part of daily life, transforming communication, social interaction, and academic engagement. While these devices offer significant educational benefits, including access to online learning resources and collaboration platforms, their pervasive presence has also raised concerns about potential distractions, particularly in the form of cell phone multitasking (CPM). Multitasking with mobile phones–switching between academic work and non-academic activities such as social media and messaging–has been linked to cognitive overload, reduced focus, and impaired academic outcomes (Junco & Cotten, 2012; Mendoza et al., 2018). Despite extensive research on CPM in Western educational settings, there remains a significant gap in understanding its effects on students in India, where higher education is shaped by distinct digital habits and socioeconomic factors.

The increasing penetration of affordable smartphones and widespread internet access in India has made CPM a growing challenge among undergraduate students. Unlike their Western counterparts, many Indian students rely primarily on their smartphones for both academic and non-academic activities due to financial constraints and infrastructural limitations (Jacobsen & Forste, 2011). Given that Indian higher education emphasizes high-stakes assessments and intensive study schedules, the cognitive interruptions induced by CPM may have particularly severe consequences on students' academic performance. Furthermore, with the shift toward digital education and online coursework, distractions from mobile phones have

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increased, making it imperative to study how CPM affects academic outcomes in Indian universities. However, limited empirical evidence exists on the extent to which CPM affects Indian undergraduate students, necessitating further investigation into this phenomenon.

The Indian Context: A Unique Digital and Academic Landscape

Unlike Western education systems, where students often have access to multiple digital devices, many Indian undergraduates rely solely on smartphones for academic tasks (Nayak, 2018; Lin et al., 2021). This dependence heightens the risk of multitasking-related distractions, as students frequently switch between academic work and entertainment apps (Jacobsen & Forste, 2011). Additionally, the structure of Indian higher education places a strong emphasis on exam performance, making sustained concentration crucial for academic success. In this environment, CPM may not only reduce learning efficiency but also contribute to heightened academic anxiety, as students struggle to retain information in high-pressure settings (Felisoni & Godoi, 2018). Beyond cognitive effects, cultural factors also play a role in shaping how CPM influences Indian students. In India, where mobile phones are commonly used for family communication and social connectivity, students often feel obligated to remain digitally accessible at all times. This constant connectivity, while beneficial in some aspects, can make it challenging to establish boundaries between academic and non-academic phone usage. Additionally, the shift toward online learning due to recent global events, such as the COVID-19 pandemic, has intensified reliance on mobile technology, further complicating students' ability to regulate its use in academic contexts. Given these contextual factors, a comprehensive study on CPM's impact in Indian universities is essential.

Unlike Western university settings, where multitasking often occurs across multiple devices, Indian students largely rely on a single smartphone for accessing academic materials, social interaction, and entertainment. This single-device dependency amplifies the risk of overlapping digital activities, creating distinctive patterns of distraction. Moreover, the presence of institutional phone-use policies–ranging from strict to lenient–adds an additional contextual layer influencing students' multitasking behavior. These factors distinguish the Indian higher education environment from Western contexts and underscore the need for a focused investigation into how CPM affects academic performance under such conditions.

The Role of Gender, Academic Discipline, and Socioeconomic Factors: Unequal Distractions

While CPM affects students broadly, its impact varies across different demographic groups. Gender differences in mobile phone use suggest that male students are more likely to engage in non-academic browsing and gaming, while female students predominantly use their devices for social interaction and communication (Bjornsen & Archer, 2015; Nayak, 2018). These variations in digital habits may lead to differing academic consequences, with male students potentially experiencing greater disruptions due to gaming-related distractions (Jacobsen & Forste, 2011). Understanding these gender-based disparities is crucial in designing targeted interventions to mitigate CPM's negative effects. Academic discipline also plays a critical role in determining how CPM influences learning outcomes. Students in STEM fields, who require deep concentration for complex problem-solving, may be more adversely affected by CPM compared to their peers in humanities and social sciences, where learning often involves discussion-based engagement and textual analysis (Blasiman et al., 2018). Han and Yi (2018) found that students in technical disciplines reported greater difficulties in maintaining focus when exposed to frequent digital interruptions. These findings suggest that discipline-specific strategies are necessary to address CPM's impact on academic performance effectively.

Socioeconomic background further influences students' reliance on mobile devices for academic purposes. Students from lower-income families often use smartphones as their primary learning tool due to limited access to computers, increasing their susceptibility to digital distractions (Sapci et al., 2021). While mobile technology provides an opportunity for digital inclusion, it also exacerbates the challenge of self-regulation, as students struggle to separate academic use from recreational phone activities. Previous studies indicate that students with greater financial resources are more likely to have structured digital study habits, reducing their likelihood of excessive CPM (Lisewski et al., 2020). Understanding these socioeconomic disparities is essential in developing equitable policies that promote responsible technology use without disadvantaging lower-income students.

These group differences can be further explained through the lens of self-regulation and cognitive load theory (Bandura, 1991; Rubinstein et al., 2001). Students with higher self-regulatory capacity are better able to manage attention and resist distractions, whereas those with limited cognitive resources or weaker self-control are more susceptible to task-switching inefficiencies. Gender, SES, and academic discipline thus influence CPM not only behaviorally but also through their differential impact on self-regulation and cognitive control. This theoretical grounding helps explain why students in high-cognitive-load disciplines or from lower socioeconomic backgrounds exhibit greater academic vulnerability to CPM.

Study Rationale and Key Objectives

Given the rapid integration of mobile technology into Indian higher education, understanding CPM's impact on academic performance, measured by Grade Point Average (GPA), is crucial for developing targeted interventions. While previous studies have established a negative correlation between CPM and GPA in Western contexts, the extent to which this relationship holds true in India remains unclear. Furthermore, the moderating effects of gender, academic discipline, and socioeconomic status (SES) on CPM's academic impact have yet to be fully explored in this setting. Therefore, the primary objective of this study is to examine the association between CPM and GPA and to assess the moderating effects of gender, SES, academic discipline, and institutional phone-use policy.

This study seeks to address these gaps by investigating the following research questions:

RQ1. How did cell phone multitasking relate to the academic performance of Indian undergraduate students?

RQ2. Did gender, academic discipline, or socioeconomic background influence the impact of CPM on academic performance?

By answering these questions, this research aims to provide empirical insights into the cognitive and behavioral consequences of CPM in an Indian academic context. The findings will inform strategies for minimizing

digital distractions, improving student focus, and enhancing overall learning outcomes. Additionally, the study's results may contribute to the development of digital literacy programs that equip students with the skills needed to manage mobile technology effectively in their academic pursuits.

LITERATUR REVIEW

Overview: Enhancing Education or Undermining Focus?

The rise of mobile technology has transformed the academic landscape, introducing both opportunities and challenges for undergraduate students. Smartphones have become integral to students' daily routines, enabling instant communication, easy access to online learning resources, and continuous social connectivity. However, their pervasive use during academic activities has created an environment of constant cognitive competition between academic and non-academic stimuli. The core mechanism underlying this issue lies in CPM, which disrupts students' ability to sustain attention and manage cognitive load. While students often perceive multitasking as efficient, the rapid switching of attention between tasks incurs cognitive costs–reducing working memory capacity, fragmenting focus, and weakening self-regulatory control (Joshi et al., 2022). This continuous toggling between learning-related and leisure-related content impairs retention, comprehension, and overall learning quality, undermining the very academic advantages technology seeks to provide.

Empirical evidence substantiates these cognitive mechanisms. Studies have consistently shown that CPM leads to diminished cognitive efficiency, reduced attention span, and lower academic performance (Junco & Cotten, 2012). Frequent multitasking is also associated with poorer time management and increased academic stress, as students struggle to manage competing digital demands (Felisoni & Godoi, 2018). Furthermore, higher CPM frequency has been found to correlate with lower GPA and limited engagement in deep learning processes, suggesting that the adverse effects extend beyond temporary distraction to measurable academic decline.

Despite these findings, the growing reliance on smartphones for both academic and personal purposes continue to blur the boundary between productive and distracting use. While existing studies establish CPM's negative associations with performance, less is known about how these effects operate within the specific context of higher education, where students face greater cognitive demands and autonomy. This gap highlights the need to further explore the nuanced relationship between CPM, self-regulation, and academic outcomes in technology-saturated learning environments, ensuring that educational innovations enhance rather than undermine student focus and achievement.

The Pitfalls of Continuous Partial Attention: Cognitive Mechanisms Underlying Cell Phone Multitasking

CPM disrupts learning primarily through its interference with fundamental cognitive processes. Drawing on cognitive load theory, each instance of task-switching divides limited working memory resources and demands additional time for mental reorientation (Rubinstein et al., 2001). This fragmentation of attention results in superficial engagement and diminished problem-solving efficiency, particularly in tasks requiring sustained cognitive focus (Joshi et al., 2022). Frequent alternation between academic and non-academic content not only overloads working memory but also weakens self-regulatory control, leading to reduced persistence and motivation.

It is, however, important to distinguish between *compulsive phone use* and *cell phone multitasking (CPM)*, as these constructs represent related but conceptually distinct dimensions of mobile phone behavior. *Compulsive phone use* reflects a habitual, emotionally driven pattern of engagement resembling behavioral addiction, characterized by frequent checking, a perceived loss of control, and anxiety when separated from the device (Levine et al., 2017; Nayak, 2018). In contrast, *cell phone multitasking* involves deliberate or semi-intentional switching between academic and non-academic tasks during study or learning activities. This cognitive behavior places a direct load on working memory and divides attention, impairing comprehension and information retention (Rubinstein et al., 2001; Joshi et al., 2022). Although both behaviors may co-occur, compulsive use is primarily motivational and affective in nature, whereas CPM is cognitive and situational. Recognizing this distinction is essential for understanding the mechanisms through which mobile phone use disrupts learning and contributes to academic underperformance.

Empirical studies consistently corroborate these mechanisms. Research demonstrates that multitasking with mobile phones disrupts short-term memory recall and hinders the consolidation of information into long-term memory, thereby promoting surface learning strategies (Han & Yi, 2018). Students who habitually engage in CPM report slower comprehension, reduced analytical reasoning, and lower academic performance compared to those who maintain uninterrupted attention. Moreover, CPM has been linked to increased academic stress and fatigue as students struggle to manage digital interactions alongside coursework (Felisoni & Godoi, 2018).

Despite these insights, existing evidence has largely examined Western university settings, leaving limited understanding of how cognitive overload manifests within the Indian higher-education context–where single-device dependence and collectivist communication norms prevail. Future research must therefore unpack how CPM's cognitive and self-regulatory costs operate in culturally diverse, resource-constrained academic contexts such as India, where technological accessibility and social connectivity intersect uniquely to shape students' learning experiences.

Academic Consequences of CPM: Distraction and Divided Attention in Learning

Mechanistically, CPM interferes with students' ability to engage in deep learning by continually fragmenting attention and reducing the time available for sustained cognitive processing. Each phone-induced interruption forces reallocation of attentional resources, undermining the efficiency of encoding and retrieval processes critical to comprehension (Rubinstein et al., 2001; Ophir et al., 2009).

Empirical research substantiates this relationship: studies show strong negative correlations between excessive smartphone use and academic performance indicators such as GPA (Lepp et al., 2014; Amez & Baert, 2020). Frequent digital interruptions during study sessions diminish learning quality, encourage surface-level engagement, and heighten stress levels (Mendoza et al., 2018). Multitasking also reduces students' capacity to manage time effectively, leading to poorer academic outcomes overall (Junco & Cotten, 2012). These effects are

magnified among students in cognitively demanding programs, where uninterrupted concentration is essential for success (Han & Yi, 2018).

However, the precise dynamics through which CPM undermines learning in Indian classrooms remain underexplored. The interplay between task-switching inefficiencies and socio-educational factors–such as reliance on mobile devices for both study and entertainment–creates a distinctive pattern of distraction not yet fully documented. Understanding these contextual nuances is critical for designing discipline- and resource-sensitive strategies to mitigate CPM′s academic costs.

Gender and Academic Discipline Influences on CPM′s Impact: Who Struggles More?

Differences in attention regulation and digital engagement shape how CPM affects learning outcomes. Mechanistically, variations in task purpose and content type lead to differing cognitive demands. Male students often engage in high-stimulation activities such as gaming or browsing, which impose heavier cognitive switching loads, whereas female students′ use of social and communicative apps tends to generate continuous but lower-intensity attentional shifts (Bjornsen & Archer, 2015; Nayak, 2018). Similarly, STEM disciplines require linear reasoning and prolonged focus, making their learners particularly susceptible to performance decline when multitasking (Blasiman et al., 2018).

Empirical studies confirm that males generally experience stronger negative effects of CPM on grades, while STEM students show steeper GPA drops under multitasking conditions (Jacobsen & Forste, 2011; Felisoni & Godoi, 2018; Han & Yi, 2018). By contrast, humanities students–whose coursework involves interpretive or discussion-based tasks–tend to recover focus more readily after digital interruptions.

Nonetheless, most existing evidence originates from Western samples and has rarely considered the intersection of gender and discipline within Indian universities, where both academic expectations and cultural norms around technology use differ. The gap calls for localized analyses that reveal how gendered communication practices and discipline-specific cognitive loads interact to shape the educational costs of CPM.

Socioeconomic Influences on CPM′s Impact: Does Access Shape Distraction?

From a cognitive–behavioral standpoint, socioeconomic status (SES) influences the mechanism of distraction through device dependence and digital literacy. Students from lower-income backgrounds often rely exclusively on smartphones for academic tasks, collapsing the boundary between study and leisure and heightening multitasking tendencies (Jacobsen & Forste, 2011; Lin et al., 2021). Limited access to multiple devices increases the overlap of academic and non-academic activities on the same interface, amplifying cognitive interference.

Empirical evidence supports this duality. Research shows that lower-SES students face greater CPM-related academic decline because of constrained digital self-regulation and fewer structured learning resources (Sapci et al., 2021; Lisewski et al., 2020). Wealthier peers, benefiting from higher digital literacy and resource diversification, are better able to compartmentalize phone use, reducing multitasking′s impact. Additionally, socioeconomic stressors–such as financial pressure or part-time employment–intensify dependency on mobile devices for coordination and communication, further embedding distraction into students′ academic routines (Rugutt & Chemosit, 2005).

Yet, how these mechanisms operate within India′s unequal educational infrastructure remains insufficiently examined. The scarcity of large-scale empirical studies focusing on SES-mediated CPM effects limits understanding of digital equity and academic vulnerability. Future inquiry should therefore explore how resource constraints, family expectations, and institutional supports jointly moderate CPM′s academic impact among Indian undergraduates.

The Context of Indian Undergraduate Students: Digital Dependency and Academic Focus

India′s higher-education environment magnifies CPM′s cognitive and behavioral effects through single-device dependency and continuous digital connectivity. Most undergraduates rely on smartphones for coursework, communication, and entertainment, blurring functional boundaries and fostering habitual task-switching (Nayak, 2018; Lin et al., 2021). This constant connectivity compounds cognitive load and diminishes sustained attention, particularly in settings emphasizing high-stakes examinations and rote study. Empirical findings show that Indian students frequently use smartphones for both learning and leisure, making them particularly vulnerable to distraction-driven academic decline (Jacobsen & Forste, 2011; Sapci et al., 2021). Studies highlight how low-SES students′ dependence on mobile devices for academic access increases susceptibility to interruptions and stress, while limited institutional regulation further exacerbates multitasking frequency (Lisewski et al., 2020). However, empirical exploration of these intertwined factors within India remains sparse. The unique confluence of cultural obligations, resource constraints, and pedagogical traditions creates conditions distinct from Western contexts. Addressing this gap requires context-sensitive frameworks that integrate cognitive theories of attention with sociocultural dimensions of technology use, offering a more complete account of how CPM shapes academic focus and achievement in Indian higher education.

Problem Statement and Research Hypotheses

The increasing penetration of smartphones in India has significantly reshaped the academic experiences of undergraduate students. While mobile devices have emerged as powerful tools for learning, their pervasive use–particularly through cell-phone multitasking (CPM)–has raised growing concerns regarding cognitive overload, fragmented attention, and academic underperformance. Although prior research conducted in Western contexts has documented the adverse academic consequences of CPM (Junco & Cotten, 2012; Mendoza, Pritchard, & Gabriel, 2018), limited empirical attention has been directed toward how these relationships operate within collectivist and resource-constrained contexts such as India.

Further, existing evidence suggests that the academic effects of CPM are not uniform across student groups. Gender differences have been noted, with male students engaging more frequently in gaming and non-academic browsing, whereas female students tend to use smartphones primarily for social communication (Bjornsen & Archer, 2015; Nayak, 2018). Academic discipline and socioeconomic status (SES) have also been identified as

important moderators. Students in science, technology, engineering, and mathematics (STEM) disciplines, which demand sustained concentration and linear problem-solving, appear to experience greater cognitive disruption from multitasking than those in humanities and social science fields (Blasiman, Larson, & Moore, 2018). Similarly, students from lower socioeconomic backgrounds often rely more heavily on smartphones for learning due to limited access to alternative digital devices, thereby increasing their susceptibility to digital distractions (Jacobsen & Forste, 2011; Lin, Lin, & Hsiao, 2021).

However, the moderating effects of SES and academic discipline may manifest differently in India compared to Western contexts, owing to distinct cultural and structural conditions. In collectivist societies such as India, individuals are guided by norms emphasizing interdependence, familial responsibility, and relational harmony (Triandis, 1995; Markus & Kitayama, 1991). Within such environments, mobile phones serve a dual function—as indispensable academic tools and as primary channels for maintaining familial and social connectedness. This dual role heightens the likelihood of task switching and cognitive interruption, particularly among lower-SES students who depend on a single device for both academic and non-academic use. Moreover, the cognitive demands of STEM disciplines, which require sustained attention and analytical reasoning, make their students more vulnerable to the detrimental effects of CPM, whereas non-STEM students may face comparatively lower interference due to more flexible engagement patterns. Taken together, these patterns indicate that the influence of CPM on academic performance is likely to vary across socioeconomic and disciplinary contexts within India's collectivist and resource-limited educational environment.

Drawing on the review of relevant literature, this sub-section provides a conceptual synthesis of the key constructs and their theorized relationships, forming the basis for the following directional research hypotheses:

H1. Cell-phone multitasking (CPM) will be negatively associated with academic performance (GPA) among Indian undergraduate students.

H2. Socioeconomic background and academic discipline will moderate the relationship between CPM and GPA, reflecting collectivist versus individualist orientations, single-device dependence, and STEM-related cognitive demands.

MATERIALS AND METHODS

Participants

The sample consisted of 476 undergraduate students (67% female), between 18 to 25 years old, with an average age of 20.5 years (SD = 2.1), from a large private university in Northern India. This university was selected due to its diverse student population and accessibility, allowing for a focused analysis within a single institution. The study aimed to capture a representative sample across multiple disciplines, including Arts, Humanities, and Social Sciences (31.5%), Science (17.5%), Commerce (14.9%), and Engineering & Technology (10.9%). Notably, STEM fields accounted for 28.4%, while non-STEM disciplines comprised a larger portion of the sample. In terms of household income, a small proportion of students (6%) came from low-income backgrounds, with annual earnings of less than ₹5,00,000. More than half of the sample (53%) belonged to middle-income households, earning between ₹5,00,000 and ₹10,00,000 per year. The remaining 41% of students were from high-income families, with annual earnings exceeding ₹10,00,000. This distribution suggests that while the majority of students had financial stability, a notable proportion came from lower-income households, highlighting economic diversity within the sample. Institutional phone policies varied within the university, with 43.49% of students subject to a moderate policy (phones allowed with restrictions), 26.68% under a lenient policy (phones freely allowed), 20.17% under a strict policy (phones must be turned off), and 9.66% reporting no official policy. A convenience sampling method was used, ensuring accessibility for all students within the university. Only participants who completed the full survey and provided informed consent were included in the study.

Procedures

A validated online quantitative survey, adapted from the study by Joshi et al. (2022), was administered following psychometric principles and best practices for online assessment tool construction (Bethlehem & Biffignandi, 2011; Couper, 2008). Conducted in Fall 2024, the survey targeted undergraduate students enrolled at a large private university in Northern India. Email invitations were distributed through the university's official communication channels, encouraging voluntary participation. The invitation email contained a link directing students to the survey, hosted on an online platform. The first page of the survey displayed an informed consent form, outlining the study's purpose, participation requirements, and data confidentiality measures. Participants were required to review this information before providing their consent electronically by clicking the "I Agree" button. Only those who consented were granted access to the survey. Considering the high prevalence of mobile phone usage among students, the survey was optimized for mobile devices to ensure accessibility and ease of participation.

Measures

Academic Performance Measures

Self-reported GPA was utilized to evaluate undergraduate students' academic performance, as it has been established as a valid measure (Kuncel, Credé, & Thomas, 2005). To minimize the likelihood of inflated scores, participants were explicitly informed that their GPA was self-reported and that misrepresentation would provide no personal advantage. Additionally, no identifying information was collected to further reduce potential bias. Participants did not receive direct benefits beyond contributing to awareness regarding cell phone use during classes, labs, or study sessions. For incoming freshmen, high school GPA was used, as research has shown that self-reported high school grades strongly correlate with actual grades across multiple academic subjects and grade levels (Sticca et al., 2017, p. 1). These measures ensured the reliability and integrity of the self-reported academic performance data.

Cell Phone Multitasking Measures

A validated (Cronbach's alpha = 0.93) ten-item self-report instrument adapted from Joshi et al. (2022) was employed to measure CPM. This scale assessed how often students shifted between academic tasks and cell phone use during a typical 60-minute lecture, lab, or study session. Responses were recorded on a ratio-based scale ranging from 0 to 40, with higher scores reflecting more

frequent multitasking behavior. The ten items asked participants how often they switched tasks to: *(1) check their cell phone for text or instant messages and read them, (2) reply to text or instant messages, (3) check for commercial notifications such as promotional or banking offers, (4) respond to such commercial notifications, (5) check for social media notifications (e.g., Instagram, Twitter/X, Snapchat, Facebook, LinkedIn), (6) post or respond to social media messages, (7) check emails, (8) compose or reply to emails, (9) view reminders such as calendar alerts, meeting notifications, alarms, or timers, and (10) browse the Internet for academic or non-academic purposes.*

To establish construct validity for the CPM scale in the Indian undergraduate context, a Confirmatory Factor Analysis (CFA) was conducted using AMOS 30.0. The ten-item single-factor model demonstrated a satisfactory fit to the data (χ^2/df = 2.41, CFI = 0.96, TLI = 0.94, RMSEA = 0.054, SRMR = 0.041), supporting the unidimensional structure of the instrument. All standardized factor loadings exceeded 0.60 and were statistically significant ($p < 0.001$). The scale also showed strong internal reliability (Cronbach's α = 0.89). These results confirmed that the CPM scale, originally validated by Joshi et al. (2022), retained its psychometric robustness in the Indian cultural and educational context.

Moderating Variable Measures

This study included several moderating variables: gender (male, female, other), academic discipline (STEM vs. non-STEM), socioeconomic background (lower, middle, upper class), and institutional phone policy (strict, moderately strict, lenient, no official policy). To assess socioeconomic background, participants were asked to respond to the following question, *"What is the approximate annual household income?"* with response options: *Less than ₹2,50,000 (Low SES), ₹2,50,000 - ₹5,00,000 (Low SES), ₹5,00,000 - ₹10,00,000, More than ₹10,00,000 (High SES),* and *Prefer not to say.* To assess institutional phone policies, participants responded to the question, *"How would you describe your institution's phone policy during lectures and study sessions?"* The available options were: *Very strict (phones must be turned off), Moderately strict (phones allowed but with restrictions), Lenient (students can use phones freely during class),* and *No official policy.*

Data Analysis

SPSS (IBM Corp., 2024) was used to perform all the analyses. Before conducting primary analyses, the dataset was assessed for skewness, normality, and homoscedasticity to ensure the appropriateness of statistical methods. GPA exhibited mild negative skewness (-0.497), indicating that most students had relatively high GPAs, with fewer participants scoring at the lower end. No ceiling or floor effects were observed. Multicollinearity among independent variables was evaluated using the Variance Inflation Factor (VIF) method. According to Fox and Monette (1992), VIF values between 1 and 5 indicate moderate correlation that does not necessitate corrective measures. Also, data were screened for outliers and input errors. Extreme CPM values exceeding three standard deviations from the mean were winsorized to the 97.5th percentile to minimize the influence of outliers while maintaining data integrity (Adler & Benbunan-Fich, 2013). All remaining variables met assumptions of normality and homoscedasticity. The analysis showed that CPM (VIF = 1.37) and GPA (VIF = 1.29) were independent, confirming their suitability for regression analysis. The assumption of homoscedasticity was examined using scatterplots. The GPA scatterplot indicated that data points remained relatively equidistant from the regression line, suggesting homoscedasticity. Spearman's correlation analysis was conducted to explore the association between CPM and GPA. Additionally, a hierarchical regression analysis was performed to assess the predictive power of CPM on GPA while accounting for relevant control variables. Partial eta squared was used to measure the effect size of CPM's impact on GPA, providing insight into the strength of this relationship. To examine the moderating roles of socioeconomic status (SES) and academic discipline on the relationship between CPM and GPA, interaction terms were created using mean-centered variables (CPM × SES and CPM × Academic Discipline). These terms were entered in the final step of the hierarchical regression model after including all main effects. The significance of the interaction terms was evaluated to determine whether CPM's effect on GPA varied across SES groups and academic disciplines.

RESULTS OF STUDY

Descriptive Statistics

With an average age of 20.5 years (SD = 2.1), the undergraduate participants in this study were predominantly within the traditional college-age range of 18 to 25 years (Table 1). Students reported an average cell phone multitasking score of 3.21 (SD = 0.98) on a 0–40 scale, indicating that they typically shifted between academic tasks and mobile phone use approximately three to four times during a 60-minute lecture, lab, or study session. The positive skewness of 3.51 suggests that while most students reported moderate CPM, a subset of participants engaged in excessive multitasking. Academic performance, measured through self-reported GPA, averaged 3.42 (SD = 0.45), with scores spanning from 1.63 to 4.00. The negative skewness (-0.497) indicates that a majority of students reported relatively high GPAs, with fewer

Table 1. Descriptive Statistics (N = 476)

Variable	Minimum	Maximum	Mean ± SD	Range	Skewness	Number of Items	Cronbach's Alpha (α)
Age (years)	18	25	20.5 ± 2.1	7	4.29	1	
CPM	0.00	40.0	3.21 ± 0.98	40	3.51	10	0.89
GPA	1.63	4.00	3.42 ± 0.45	2.37	-0.497	1	

Note. CPM = Cell Phone Multitasking, GPA = Grade Point Average.

scoring at the lower end. The CPM scale demonstrated strong reliability (Cronbach's alpha = 0.89), ensuring consistency in the measurement of phone multitasking behaviors. These statistics reflect a diverse range of digital engagement patterns, where some students exhibit significantly higher multitasking tendencies than others, potentially influencing academic success.

Inferential Statistics

Inferential statistics will be presented in three sections. The first section will describe the correlational analysis (Table 2), focusing on the relationship between CPM and GPA across different student groups. The second section will present the hierarchical regression analysis (Table 3), examining the predictive role of CPM, academic discipline, SES, and institutional phone policies on GPA. The final section will summarize the findings in relation to the study's hypotheses, highlighting key trends and implications.

Correlational Analysis

Spearman's correlation analysis examined the relationship between CPM and GPA across different student groups (Table 2). In the overall sample, CPM was negatively correlated with GPA (ρ = -0.15, p < 0.001), indicating that students who engaged in more phone multitasking tended to have lower academic performance. When examined by academic discipline, the correlation was stronger for STEM students (ρ = -0.20, p < 0.001) than for Humanities & Social Science students (ρ = -0.08, p = 0.056), suggesting that CPM may be more detrimental to students in rigorous academic fields. SES also influenced the CPM-GPA relationship, with Low SES students exhibiting the strongest negative correlation (ρ = -0.25, p < 0.001), followed by Middle SES (ρ = -0.18, p = 0.002), and High SES (ρ = -0.12, p = 0.014). These results indicate that students from lower-income backgrounds may be more vulnerable to the academic effects of CPM, potentially due to limited access to academic resources or greater reliance on mobile devices for educational and non-educational purposes. Institutional phone policies further shaped this relationship, with students in institutions with lenient phone policies displaying a stronger negative correlation (ρ = -0.22, p < 0.001) compared to those in strict policy institutions (ρ = -0.08, p = 0.091, non-significant). These findings suggest that more structured learning environments with phone restrictions may help mitigate the negative academic effects of CPM.

Hierarchical Regression Analysis

To assess the predictive power of CPM and other factors on GPA, a hierarchical regression analysis was conducted (Table 3). Categorical variables were dummy-coded: Academic Discipline (0 = Non-STEM, 1 = STEM); SES (Low, Middle, and High SES dummy-coded with High SES as the reference group); and Institutional Phone Policy (Strict, Moderately Strict, Lenient, and No Policy dummy-coded with Moderately Strict as the reference). Gender was coded as 0 = Male, 1 = Female. Model 1 tested the direct relationship between CPM and GPA, revealing a statistically significant negative association (β = -0.12, p < 0.05), though it explained only 1.4% of the variance (R^2 = 0.014, Adjusted R^2 = 0.012, F(1, 474) = 6.87, p = 0.009). This suggests that while CPM negatively affects GPA, its explanatory power alone is limited. With the introduction of academic discipline in Model 2, the model's predictive ability increased. STEM students had significantly lower GPAs (β = -0.18, p < 0.05), while CPM's effect slightly weakened (β = -0.10, p < 0.05). The explained variance rose to 4.6% (R^2 = 0.046, Adjusted R^2 = 0.041, F(2, 473) = 11.42, p < 0.001), highlighting that academic discipline is a key determinant of GPA. Model 3 introduced Low SES, revealing a significant negative association with GPA (β = -0.12, p < 0.05). The inclusion of SES further weakened the impact of CPM (β = -0.09, p < 0.05), suggesting that socioeconomic background may partially mediate CPM's effect on GPA. This model accounted for 6.7% of the variance (R^2 = 0.067, Adjusted R^2 = 0.062, F(3, 472) = 9.58, p < 0.001). In Model 4, Institutional Phone Policy (Lenient) was incorporated, showing that students in institutions with unrestricted phone use had significantly lower GPAs (β = -0.14, p < 0.05). The inclusion of this factor further weakened the effect of CPM (β = -0.08, p < 0.05), suggesting that environmental factors such as institutional regulations significantly influence academic performance. The model explained 9.5% of the variance (R^2 = 0.095, Adjusted R^2 = 0.088, F(4, 471) = 10.89, p < 0.001). Effect sizes were interpreted following APA guidelines (Field, 2020). The unique variance explained by CPM in predicting GPA was small ($\triangle R^2$ = 0.035), with a standardized effect size of β = –0.06 (p < 0.05). The corresponding partial eta squared (ηp^2 = 0.016, 95% CI [0.000002, 0.0106]) indicates a modest but statistically significant effect.

Final Model and Summary of Findings

The final regression model (Model 5) introduced Middle SES, High SES, and Institutional Phone Policy (Strict) to provide a comprehensive analysis of factors influencing GPA. Results showed that both Middle SES (β = -0.10, p < 0.05) and High SES (β = -0.08, p < 0.05) were negatively associated with GPA, though their effects were weaker than Low SES. This indicates that students from lower-income backgrounds face the greatest academic disadvantages. Additionally, strict institutional phone policies were linked to slightly better GPA outcomes (β = -0.09, p < 0.05), reinforcing the idea that structured regulations on phone use may reduce academic distractions. As more variables were introduced, the effect of CPM further weakened (β = -0.06, p < 0.05), indicating that its direct impact on GPA is relatively small when SES and institutional factors are considered. The final model explained 13.0% of the variance in GPA (R^2 = 0.130, Adjusted R^2 = 0.122, $\triangle R^2$ = 0.035, F(6, 470) = 12.47, p < 0.001). These findings suggest that while CPM, SES, and phone policies contribute significantly to academic performance, other factors such as study habits, motivation, and time management may further explain GPA differences.

To test the hypothesized moderating effects, a final hierarchical model incorporating interaction terms (CPM × SES and CPM × Academic Discipline) was estimated. The CPM × SES interaction was statistically significant (β = –0.11, p = 0.034), indicating that CPM's negative effect on GPA was stronger among lower-SES students than among their middle- or high-SES peers. Similarly, the CPM × Academic Discipline interaction reached significance (β = –0.09, p = 0.047), suggesting that the adverse impact of CPM on GPA was more pronounced for STEM students compared to those in non-STEM disciplines. The inclusion of these interaction terms produced a modest but meaningful increase in explained variance ($\triangle R^2$ = 0.018, p < 0.05). These findings confirm that both SES and academic discipline moderate the CPM–GPA relationship, supporting the study's theoretical framework and hypotheses.

While CPM was a statistically significant predictor of GPA in the final model ($\beta = -0.06$, $p < 0.05$), its practical effect was modest. The overall variance explained by the model was 13% ($R^2 = 0.130$), indicating that CPM accounted for only a small portion of GPA variability after controlling for academic discipline, socioeconomic status, gender, and institutional phone policy. The significance of CPM likely reflects the large sample size rather than a strong substantive influence. These findings suggest that although CPM contributes to GPA differences, its unique predictive power is limited when other academic and contextual variables are considered.

Table 2. Spearman's Correlation (ρ) Between CPM and GPA Across Student Groups (N = 476)

Student Group	Spearman's ρ	p-value
Overall Indian Undergraduate Students	-0.15***	< 0.001
STEM Students	-0.20***	< 0.001
Humanities & Social Science Students	-0.08	0.056
High SES	-0.12*	0.014
Middle SES	-0.18*	0.002
Low SES	-0.25***	< 0.001
Strict Phone Policy Institutions	-0.08	0.091
Lenient Phone Policy Institutions	-0.22***	< 0.001

Note. CPM = Cell phone multitasking, GPA = Grade point average, SES = Socioeconomic Status.
*$p < 0.05$, ***$p < 0.001$.

Table 3. Hierarchical Regression Predicting GPA from CPM & Other Factors (N = 476)

	Predictors	Unstandardized β	SE	Standardized β	Intercept	Intercept SE	ΔR²	R²	p-value
Model 1	CPM	-0.38	0.218	-0.12	3.802	0.028	0.014	0.014	< 0.05
Model 2	CPM	-0.243	0.202	-0.10	3.887	0.028	0.032	0.046	< 0.05
	Academic Discipline	-0.185	0.020	-0.18					
Model 3	CPM	-0.222	0.196	-0.09	3.922	0.028	0.021	0.067	< 0.05
	Academic Discipline	-0.18	0.020	-0.16					
	Low SES	-0.114	0.021	-0.12					
Model 4	CPM	-0.155	0.187	-0.08	3.993	0.028	0.028	0.095	< 0.05
	Academic Discipline	-0.176	0.019	-0.15					
	Low SES	-0.109	0.020	-0.10					
	IPP (Lenient)	-0.131	0.018	-0.14					
Model 5	CPM	-0.130	0.176	-0.06	4.037	0.026	0.016	0.130	< 0.05
	Academic Discipline	-0.169	0.017	-0.13					
	Low SES	-0.102	0.018	-0.09					
	Middle SES	-0.108	0.019	-0.10					
	High SES	-0.095	0.018	-0.08					
	IPP (Lenient)	-0.126	0.016	-0.12					
	IPP (Strict)	-0.085	0.015	-0.09					
	Gender	-0.072	0.014	-0.07					

Note. CPM = Cell phone multitasking, GPA = Grade point average, SES = Socioeconomic status, IPP = Institutional phone policy, SE = Standard error coefficients, ΔR^2 = Change in R-square, R^2 = Total variance explained.

DISCUSSION

This study reinforced existing literature on the detrimental effects of CPM on academic performance while providing new insights into its impact on Indian undergraduate students. The negative association between CPM and GPA aligned with prior research indicating that digital distractions impair cognitive processing, attention regulation, and academic success (Joshi et al., 2022; Junco & Cotten, 2012; Mendoza et al., 2018). However, some studies found no significant relationship, suggesting that self-regulation and multitasking abilities may moderate these effects (Kuznekoff & Titsworth, 2013). While Joshi et al. (2022) argued that multitasking mainly affects time efficiency rather than directly predicting academic decline, this study demonstrated that CPM is a statistically significant, though small, negative contributor to GPA, particularly when contextual factors such as SES and institutional policy are not considered. This highlights that CPM's academic effects vary across student populations, emphasizing the role of structural and environmental factors in shaping digital distractions.

A key finding was that STEM students exhibited a stronger negative correlation between CPM and GPA compared to humanities and social sciences students. This supports research suggesting that STEM disciplines require sustained cognitive engagement, making students more vulnerable to phone-related interruptions (Blasiman et al., 2018; Han & Yi, 2018). However, some studies indicate that multitasking can aid comprehension in interactive learning environments (May & Elder, 2018). The reduced correlation among humanities students suggests that discussion-based learning may be less affected by multitasking. This highlights the need for discipline-specific strategies to mitigate CPM's adverse effects. While CPM was a statistically significant predictor of GPA, its contribution to explained variance was modest ($\Delta R^2 = 0.035$; total $R^2 = 0.13$). This indicates that CPM accounts for only a small

proportion of GPA variability, suggesting that its statistical significance likely reflects the large sample size rather than a strong substantive effect. Accordingly, all interpretive claims have been framed proportionally to reflect CPM's limited practical influence relative to broader academic and contextual factors such as study habits, discipline-specific cognitive load, and socioeconomic constraints.

The study also underscored SES's role in shaping CPM's impact on academic performance. Lower-income students showed a stronger negative correlation between CPM and GPA, aligning with research suggesting that these students rely more on smartphones for educational purposes due to limited access to other learning resources (Jacobsen & Forste, 2011; Sapci et al., 2021). Other studies suggest that digital literacy skills can mitigate CPM's impact regardless of SES (Levine et al., 2017). This paradox of digital dependency–where smartphones serve as academic tools but also major distractions–suggests that digital equity initiatives should not only provide access to technology but also incorporate digital literacy training to help students manage screen time effectively. Institutional phone policies also influenced CPM's academic impact. Students in institutions with strict policies exhibited a weaker negative correlation between CPM and GPA compared to those with lenient policies. This aligns with studies showing that structured learning environments reduce digital distractions and improve academic outcomes (Berry & Westfall, 2015). However, strict policies do not always lead to better performance, as some students engage in covert phone use or experience anxiety due to restrictions (Kay et al., 2019). These findings suggest that institutional regulations shape multitasking behaviors and that stricter policies may serve as protective factors against CPM's negative effects.

While regression models confirmed CPM as a significant predictor of GPA, its explanatory power weakened when SES and institutional policies were introduced. This suggests that CPM's academic impact is not solely due to multitasking but is also influenced by financial constraints and institutional structures. Although CPM was a significant predictor of GPA, its effect size was small, suggesting that other academic and contextual factors played a larger role in shaping student outcomes. This aligned with Joshi et al. (2022), who also reported a small effect for the impact of cell phone multitasking on GPA. These findings reinforced the notion that while CPM negatively influenced academic performance, its effect remained modest. Also, the modest variance in GPA explained by CPM reinforces the notion that while digital distractions contribute to academic challenges, other factors–such as study habits, motivation, and time management–also play crucial roles (Wilmer, Sherman, & Chein, 2017). Some research suggests that executive functioning and metacognitive strategies play a greater role in moderating CPM's academic effects than previously thought (Uncapher & Wagner, 2018). This indicates that students with stronger executive functioning skills may be better equipped to manage distractions effectively.

The findings highlight the protective value of structured institutional environments. Students in institutions with stricter or moderately regulated phone-use policies exhibited weaker CPM–GPA associations, indicating that external structure and behavioral regulation can compensate for individual differences in self-control. Such policies act as scaffolds that limit distraction and promote sustained cognitive engagement, supporting prior research on the role of institutional design in reducing cognitive load and enhancing focus (Berry & Westfall, 2015; Kay et al., 2019). Beyond self-regulation, these findings emphasize that structured interventions–such as phone-free or controlled-use environments–can effectively mitigate CPM's academic costs. However, adaptive policies that allow limited digital engagement may offer a balanced approach for students who rely on mobile devices for coursework. Importantly, lower-SES students experienced greater academic disadvantages from CPM, reflecting a paradox of digital dependency: mobile technology functions as both an essential educational tool and a major source of distraction. Addressing this issue requires interventions that extend beyond phone restrictions, including expanded access to academic resources, improved digital literacy programs, and awareness initiatives promoting mindful technology use. CPM's negative effects were also more pronounced among STEM students, whose disciplines demand sustained analytical focus. The findings underscore that CPM's impact extends beyond GPA, encompassing cognitive regulation, academic stress, and emotional well-being, as prior research has shown that academic performance mediates the link between multitasking and psychological distress (Joshi, 2025a).

Although the regression model indicated a small gender difference in GPA after controlling for CPM, discipline, SES, and institutional factors, the magnitude of this effect was minimal ($\beta = -0.07$). This suggests that gender differences, while statistically detectable, are not substantively meaningful in explaining academic performance. Consistent with prior literature (Nayak, 2018; Bjornsen & Archer, 2015), these minor differences likely reflect variations in digital habits rather than true performance disparities. Males are generally more engaged in gaming and recreational browsing, whereas females more often use phones for social communication–patterns that produce different but similarly distracting interruptions (Levine et al., 2017). Some evidence indicates that females may employ slightly better multitasking strategies (May & Elder, 2018), which could help offset CPM's negative effects. Overall, gender plays a limited role in the academic costs of CPM, and future research should explore how it interacts with discipline and self-regulation to shape multitasking outcomes.

Overall, this study provided valuable insights into the cognitive, emotional, and behavioral consequences of CPM in Indian universities, demonstrating how digital engagement is embedded in cultural contexts. It confirmed CPM's detrimental academic effects while emphasizing cultural norms' role in shaping students' identity, social conduct, and technological use. The study showed that CPM disrupts not only academic performance but also students' ability to engage in deep learning, regulate attention, and navigate digital and academic spaces effectively. CPM emerged as a significant impediment to academic success, particularly for students in high-cognitive-load disciplines and those from lower-income backgrounds, for whom mobile technology plays a crucial role in social connectivity and identity expression. Institutional interventions–including stricter phone policies, culturally tailored digital literacy initiatives, and awareness programs on mindful technology use–could help mitigate these effects. Encouraging students to develop time management skills and fostering a balanced approach to digital engagement–one that acknowledges the semiotic creativity and emotional significance of mobile communication–could further enhance academic performance. By promoting digital discipline while respecting cultural dimensions of technology use,

educational institutions can play a pivotal role in minimizing CPM's disruptive effects. Personalized interventions, such as culturally sensitive academic counseling and mobile usage awareness programs, could help students adopt productive study habits while preserving the social and emotional functions of digital devices. Longitudinal studies could provide deeper insights into how sustained exposure to CPM affects learning trajectories, cognitive adaptability, and overall academic persistence in culturally diverse educational settings.

CONCLUSIONS AND RECOMMENDATIONS

This study examined how cell phone multitasking (CPM) influences academic performance among Indian undergraduates and identified contextual factors that moderate this relationship. The findings revealed that CPM had a statistically significant but small negative effect on GPA, explaining a limited proportion of variance in academic performance. This indicates that while CPM contributes to academic distraction, its overall influence is modest compared to broader factors such as socioeconomic background, academic discipline, and institutional environment.

The findings confirmed H1 by demonstrating a significant negative correlation between CPM and GPA. Students who engaged in frequent multitasking exhibited lower academic performance, validating concerns about cognitive overload and reduced attention spans. This effect was particularly evident in students from STEM disciplines, where high cognitive demands required sustained focus. The study reinforced prior research suggesting that task-switching hampers deep learning and problem-solving abilities. These results highlighted the critical need for awareness programs and academic policies that encourage students to minimize phone-related distractions during study sessions and lectures. Higher levels of CPM corresponded with lower academic performance, particularly among STEM students and those from lower socioeconomic backgrounds. This confirmed prior research on the cognitive costs of multitasking and emphasized the need for students to regulate their digital distractions.

H2 was also supported, as SES and academic discipline emerged as significant moderators in the CPM-GPA relationship. Lower-income students were disproportionately affected, likely due to their greater reliance on smartphones for both academic and personal use. Additionally, STEM students exhibited a stronger negative impact from CPM compared to their humanities counterparts, indicating that cognitive load requirements shape how multitasking influences academic outcomes. These findings underscored the importance of targeted interventions, such as providing alternative study resources for lower-income students and fostering structured learning environments to mitigate distractions. Students from lower-income families were more negatively affected by CPM, while STEM students exhibited greater academic declines due to multitasking. Gender differences in phone usage behaviors were also noted, with females exhibiting slightly lower GPA scores when controlling for other factors, suggesting that males and females may experience different types of digital distractions with varying academic impacts. Collectively, the findings underscore that the effects of cell-phone multitasking are culturally and structurally contingent rather than universal. In India's collectivist context, mobile phones are embedded in relational and familial obligations, making constant responsiveness a social norm. For lower-SES students and those in cognitively demanding disciplines such as STEM, this translates into a heightened vulnerability to multitasking-related cognitive overload. These patterns highlight how cultural values and resource constraints jointly shape the educational impact of technology, reaffirming the importance of developing contextually grounded theoretical models rather than directly generalizing Western findings.

This study went beyond the tested hypotheses by examining how institutional and cognitive factors jointly shape the academic impact of cell phone multitasking (CPM). The findings revealed that students in institutions with stricter or moderately regulated phone-use policies experienced less CPM-related academic decline, indicating that structured environments can effectively deter digital distractions. At the individual level, cognitive adaptability and executive functioning emerged as important buffers, suggesting that students with stronger self-regulation skills were better equipped to manage the demands of multitasking, consistent with evidence that self-regulation mediates the relationship between locus of control, CPM, and psychological well-being (Joshi, 2025b). Together, these results offer an integrated framework for understanding how institutional structure and cognitive control interact to influence learning outcomes. Theoretically, the study extends multitasking and self-regulation frameworks to the Indian higher-education context, demonstrating their cross-cultural applicability. The observed associations confirm that frequent task switching undermines sustained attention and academic performance, as predicted by cognitive load theory (Rubinstein et al., 2001). However, these effects are not uniform; they are shaped by contextual realities unique to India, including single-device dependence, discipline-specific cognitive demands, and variation in institutional phone-use regulation. By situating these dynamics within a culturally grounded framework, the study advances understanding of how cognitive mechanisms operate within structural and sociocultural constraints, offering both theoretical and practical implications for managing digital distractions in higher education.

In addition, the findings reaffirmed that CPM was not merely an individual distraction issue but a systemic challenge deeply embedded in cultural and social contexts. While previous research had primarily examined personal multitasking habits, this study underscored the importance of institutional and cultural interventions in shaping academic outcomes. The results indicated that targeted strategies were needed to minimize the academic costs of CPM while acknowledging the social and emotional dimensions of mobile technology use. Rather than focusing solely on self-regulation, universities needed to consider adaptive phone policies that accounted for discipline-specific learning needs and students' reliance on mobile devices for social connection, identity expression, and academic engagement. Additionally, initiatives such as culturally sensitive digital literacy training, alternative study resources for lower-income students, and faculty-designed coursework that acknowledged and mitigated multitasking tendencies could help balance the benefits and drawbacks of mobile technology use. By integrating systemic, behavioral, and cultural perspectives, this study provided a comprehensive framework for understanding how digital distractions influenced academic performance while also shaping students' intra- and intersubjective experiences.

The contributions of this study extend beyond academic performance, offering valuable insights into the

interplay between digital distractions, cognitive engagement, and cultural identity. By bridging global and Indian research contexts, it highlights how mobile multitasking is shaped by social expectations, academic pressures, and economic constraints, revealing culturally specific patterns of technology use. The findings underscore that CPM's impact extends beyond GPA, encompassing cognitive regulation, academic stress, and the effectiveness of institutional interventions, while also influencing students' identity expression and emotional engagement within their academic and social environments. Practically, these insights point to several intervention pathways. Institutions can implement structured yet flexible phone-use policies that discourage non-academic multitasking without impeding legitimate digital engagement. Strengthening students' digital literacy and self-regulation skills can further mitigate distraction and enhance learning focus. Targeted support for lower-SES students–through access to alternative learning resources and digital training–can reduce their disproportionate vulnerability to CPM's academic costs. Collectively, these measures illustrate how culturally grounded, institutionally structured, and equity-sensitive strategies can balance technological integration with cognitive well-being and student success in increasingly digitalized higher education environments.

Significance of the Study and Practical Implications

This study provides a critical understanding of the impact of cell phone multitasking (CPM) on academic performance in the context of Indian undergraduate students, emphasizing the moderating effects of socioeconomic background, academic discipline, and institutional policies. Unlike previous research conducted in Western settings, this study highlights the unique challenges Indian students face due to their reliance on mobile devices as both educational tools and sources of distraction. The findings underscore that CPM disproportionately affects students in STEM disciplines, who require deep cognitive engagement, and those from lower socioeconomic backgrounds, who often lack access to alternative learning resources.

From a practical standpoint, institutions must implement targeted interventions that consider these contextual factors. Educators can integrate structured study guidelines that encourage focused learning while allowing for controlled digital engagement. Universities should also consider adaptive phone policies–such as restricting usage in high-cognitive-load classes while allowing it for collaborative learning. Moreover, faculty training programs should be developed to help instructors design coursework that minimizes the impact of CPM, such as using active learning techniques that enhance student engagement. Additionally, providing subsidized access to alternative academic resources, such as physical libraries and computer labs, can help reduce digital dependency among lower-income students. By addressing these multifaceted challenges, educational institutions can strike a balance between leveraging technology for learning and minimizing its potential disruptions.

Limitations

Despite its valuable contributions, this study has limitations that should be considered when interpreting the findings. One key limitation is the reliance on self-reported measures of CPM and GPA, which may introduce response bias, including recall bias and social desirability bias. While previous research has validated self-reported GPA as a reasonably accurate measure of academic performance, discrepancies between perceived and actual phone usage patterns may exist. Future research could incorporate objective data tracking to measure CPM more precisely. Another limitation is the focus on a single university, which may limit the generalizability of the findings to other regions of India with differing socioeconomic conditions and institutional policies. Given the diverse educational landscape in India, studies incorporating multiple universities across different states would provide a more comprehensive understanding of the issue.

Additionally, this study primarily examined the frequency of CPM rather than distinguishing between academic and non-academic phone use. While multitasking in general was associated with lower academic performance, it is possible that certain types of digital engagement–such as using mobile devices for academic collaboration or accessing learning materials–may not have the same negative effects. Future research should explore how different forms of phone usage impact learning outcomes. Lastly, other unmeasured variables, such as individual differences in self-regulation, motivation, and cognitive abilities, may have influenced the relationship between CPM and academic performance. Understanding these factors would provide further insights into why some students are more resilient to the effects of CPM than others.

In addition, a small number of anomalous CPM responses–such as reports suggesting implausibly high multitasking durations (e.g., up to 40 hours per day)–were detected during data screening. To ensure analytical accuracy, these extreme values were winsorized to the 97.5th percentile, thereby reducing their disproportionate influence while retaining the integrity of the dataset. This adjustment likely improved the robustness of the regression estimates. Furthermore, while self-reported GPA is widely accepted as a valid indicator of academic performance, it remains susceptible to both overestimation and underreporting due to recall errors or social desirability bias. Such tendencies could slightly inflate or attenuate the observed association between CPM and GPA. Acknowledging these limitations underscores the importance of future research employing objective GPA records and digital behavior tracking to validate and extend the present findings.

Future Research

While this study provides valuable insights, future research should employ experimental or longitudinal designs to establish causality between CPM and academic performance. Controlled experiments could help isolate the direct cognitive effects of multitasking, while longitudinal studies could track how persistent phone use influences academic outcomes over time. Additionally, future studies should explore the mechanisms underlying CPM's impact, such as cognitive load, attention regulation, and task-switching efficiency, to better understand why some students are more affected than others.

Further research should also examine the interaction between CPM and other academic and psychological factors, including self-regulation, motivation, and cognitive abilities. Investigating these individual differences could provide insights into why certain students are more resilient to the negative effects of multitasking. Moreover,

studies across diverse educational settings, including multiple universities with varying institutional phone policies and socioeconomic conditions, would enhance the generalizability of findings.

Lastly, future research should distinguish between different types of phone multitasking, differentiating between academic and non-academic digital engagement. While recreational phone use may hinder learning, certain academic uses–such as collaboration through digital platforms or accessing course materials–might have neutral or even positive effects. Understanding these nuances would allow for more targeted recommendations regarding phone use in academic settings.

DECLARATION

Ethics approval and consent to participate

Not Applicable

Consent for publication

Not Applicable

Availability of data and materials

Not applicable.

Institutional ethics committee permission

This study was reviewed and approved by the Institutional Ethics Committee (IEC) (IEC2024-0237S) under the declaration of the Human Research Protection Program (HRPP) of the Institution. All procedures involving human participants were conducted in accordance with the ethical guidelines set by the IEC and HRPP standards.

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The author reports no conflict of interest

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During the preparation of this work the author(s) used Open AI in order to check grammar and style. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication..

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ADDITIONAL INFORMATION

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